Director's Independent Conceptual Design Review of the LHC CMS Detector Upgrade Project May 14-16, 2013

Charge

The Committee is to conduct a Director's Review of the LHC Compact Muon Solenoid (CMS) Detector Upgrade Project. This review is an Independent Conceptual Design Review of the Project's Conceptual Design. The LHC CMS Detector Upgrade Project received CD-0 on September 18, 2012. The Project anticipates receiving DOE Critical Decision 1 (CD-1) "Approve Alternative Selection & Cost Range" late summer of 2013.

The LHC CMS Detector Upgrade Project is the design and construction of upgrades to the Hadron Calorimeter, the Silicon Pixel detector, and the Level 1 Trigger subsystems of the CMS detector at CERN. The LHC, running at 8 TeV center of mass energy, has nearly reached its design luminosity. It is expected that with planned upgrades, it will exceed the original design by a factor of at least two. CMS was not designed to run efficiently at the luminosity now projected for the next several years. With these upgrades, the detailed study of the properties of the new boson and the search for new physics that should be associated with it can take full advantage of the excellent performance of the LHC and resolve many of the open questions in electroweak physics.

The Independent Conceptual Design part of the review is to verify that the LHC CMS Detector Upgrade Project design is technically adequate and should achieve the Project's scientific goals. To meet the requirements for CD-1 the design has to be at the conceptual level or greater. The committee will make their assessment based on the LHC CMS Detector Upgrade Project's Conceptual Design Report (CDR), drawings, specifications, and discussions with the project team.

The committee is to assess the progress of the Project's preparations to meet the CD-1 requirements of DOE O 413.3B. To meet CD-1 readiness LHC CMS Detector Upgrade Project's conceptual design needs to be sound and achievable. The review committee is asked to address the following questions to assess the Project's progress:

1. Are the science goals and physics requirements clearly stated and documented? Have the science goals and physics requirements been adequately translated into technical performance requirements and specifications?
2. Is the design technically adequate? Is the design likely to meet the technical requirements needed to carry out the scientific goals?
3. Can the design be constructed, inspected, tested, installed, operated and maintained in a satisfactory way?
4. Is there adequate supporting documentation to support the conceptual design and the transition to developing the preliminary design?

5. Are the risks (on technical, cost, and schedule basis) of the selected base design approach and alternatives understood and are appropriate steps being taken to manage and mitigate these risks? Have areas been identified where value engineering should be done? If value engineering has been performed is it documented?
6. Are the project organization and lines of responsibility clearly defined and sufficient to ensure the successful engineering and design of the project? Are the design interfaces between the US CMS Upgrade Project and the International CMS Upgrade at CERN understood and well defined to ensure a coordinated effort and an integrated design? Is there a reasonable plan in place for implementing configuration management to ensure changes to the technical requirements/specifications are controlled and communicated to all affected groups?

Finally, the committee should present findings, comments, recommendations, and answers to the above questions at a closeout meeting with LHC CMS Detector Upgrade Project and Fermilab's management. A written report will be provided within two weeks after the review.

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